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(54) **Apparatus and system for detecting elevator car overspeed**

Vorrichtung und System zur Erkennung erhöhter Geschwindigkeit einer Aufzugkabine

Appareil et système pour détecter la vitesse excessive d'une cabine d'ascenseur

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## Description

### Field of the Invention

**[0001]** The invention consists of an apparatus and a system for detecting overspeed of a car, and/or a counterweight, for elevators, for actuating the emergency braking mechanism.

### Background of the Invention

**[0002]** Different implementations are known in the state of the art for detecting elevator car overspeed.

**[0003]** Document ES 2 184 612 describes a speed limiting system for elevators, characterized in that it consists of a safety gear fixed to the elevator car and a moving part acting with the rail of the elevator; a crown wheel rotating with the rail of the elevator associated to a centrifugal speed governor; a link quadrangle in which the two opposite sides are joined to the moving part of the safety gear and to the crown wheel respectively; means tending to keep the safety gear in stand-by and means for keeping the crown wheel in contact with the rail of the elevator.

**[0004]** Document EP 475 114 describes a safety device and a centrifugal force speed governor for preventing overspeed conditions of an elevator car in both the downward direction and the upward direction. A bracket arranged in the elevator car incorporates a shaft at right angle to a guide rail arranged on the side wall. There is a U-shaped frame having a running wheel at the ends of the shaft of the sides of the wall. A telescopic compression spring extends over the shaft between the bracket and the frame to tense the shaft with an axial movement towards the side wall. As a result the running wheel is biased against the web of the guide rails. Each side of the running wheel has a pair of release levers acting on a locking wheel in the event of danger. In the release lever rotatably arranged on the running wheel there circulates, in normal car travel, each side of the running wheel around the stopped locking wheel, which is fixedly joined to a two-arm actuating lever. The movement of the actuating lever is transmitted on one hand to the release arm and on the other to the actuating bar, which is additionally in contact with the release arm that is opposite to the safety gear. The release arm circulating parallel to the guide rails is introduced in the wedge box of the safety gear. For resetting the safety device, the elevator car is restarted after a safety stop in the opposite direction of travel.

**[0005]** Documents DE 101 47 629 and EP 1 516 842 describe a safety system which prevents overspeed conditions of an elevator car. Both documents disclose a pendulum speed limiter having an auxiliary wheel configured to run on a guide rail of the elevator car. The speed limiter generates a synchronized alternating movement which changes when a predetermined speed of the elevator car is exceeded. The speed limiter further comprises a polygonal-shaped cam, a ratchet wheel and a rocker arranged on a side of the auxiliary wheel. The rocker has a first end provided with a follower for following the cam profile, and a second end provided with a ratchet for locking the ratchet wheel when the predetermined speed of the elevator car is exceeded, thus activating an actuating means for braking the elevator car.

### Description of the Invention

**[0006]** The present invention proposes an apparatus and a system that is independent of the safety gear system, that allows different types of actuations, is adaptable both to the upper part and to the lower part of the car and of the counterweight and does not necessarily have to be arranged close to the counterweight.

**[0007]** According to a first aspect, the invention describes an apparatus for detecting the overspeed of elevator components selected from a car, a counterweight and combinations thereof, having:

- a wheel, with an auxiliary surface configured to run on a first surface of a travel rail of the elevator component;
- actuating means for actuating a braking mechanism of the elevator component; and
- speed detecting means for generating a synchronized alternating movement with the speed of the elevator component;
- the speed detecting means being configured to not generate the synchronized alternating movement when a predetermined speed of the car or the counterweight is exceeded and to thus activate the actuating means.

**[0008]** The speed detecting means comprise a ratchet mechanism comprising:

- a polygonal-shaped cam in a side of the wheel, integral with said wheel;
- a ratchet wheel in the same side of the wheel and also integral with said wheel, said ratchet wheel comprising a plurality of projections;
- a rocker having a first end and a second end, provided with:
  - a follower at the first end for following the cam profile;
  - a ratchet at the second end for locking the ratchet wheel, thus locking the entire wheel;

characterised in that it comprises:

- 1) Positioning means formed by lock washers for pushing the auxiliary surface of the wheel against the rail and attempting to prevent the sliding of the wheel on the rail;
- 2) means of detecting the derailment and the varia-

tion in the pressure setting of the auxiliary surface of the wheel on the rail.

**[0009]** This pressure setting of the auxiliary wheel on the rail determines the generated friction force and the coefficient of friction between them.

**[0010]** The apparatus can also comprise slip monitoring means formed by an encoder configured to control when the auxiliary wheel slips by comparing a rotation speed of the auxiliary wheel with a travel speed of the elevator component.

**[0011]** Likewise, the apparatus may further comprise at least one roller configured to roll on a second surface of the rail opposite to the first surface of the rail for:

Offsetting a stress exerted by the auxiliary wheel on the rail for preventing transmission of a reaction force on the elevator component;

Setting a pressure between the auxiliary wheel and the rail.

**[0012]** This roller can also be used for the operation of the apparatus with different rail thicknesses and for the operation with a rail having a different surface condition, such as a dry rail or a greased wheel.

**[0013]** In addition, the apparatus further comprises remote actuating means to voluntarily engage the ratchet mechanism.

**[0014]** According to a second aspect, the invention describes a system for detecting overspeed of elevator components selected from a car, a counterweight and combinations thereof, characterized in that it comprises at least one apparatus such as the one described above and transmission means joined to the actuating means for transmitting an actuating movement to the braking mechanism of the elevator component.

**[0015]** The system can incorporate the apparatus in an upper or lower part of the car or counterweight, the transmission means comprising in a first case an actuating assembly and first pinion and a second pinion, and the transmission means comprising in a second case a plurality of levers.

Brief Description of the Drawings

**[0016]** A series of drawings is described below which aid in better understanding the invention and which are expressly related to an embodiment of said invention presented as a non-limiting example thereof.

Figure 1 is a sectional plan view showing the apparatus of the invention and its arrangement as regards a rail of an elevator. Said Figure shows the wheel or auxiliary wheel (100), the polygonal cam (110), the ratchet wheel (120), the lock washers (400), the rail (200), the roller (600) and the position of the encoder (500), which is located inside the apparatus.

Figure 2 shows a perspective view of the wheel, where the auxiliary surface of the wheel or auxiliary wheel (100), the polygonal cam (110) and the ratchet wheel (120) can be seen.

Figure 3 shows a perspective view of some components of the ratchet mechanism, such as the rocker (130), the follower (140), the ratchet (150) and the actuation of the braking system (300).

Figures 4A and 4B show two front and rear elevational views, respectively, where the rollers (600), the lock washers (400), the auxiliary wheel (100), the follower (140), the rocker (130), the position of the rail (200), the actuation (300), the coil (800) and the contacts (700) can be seen, said contacts being in charge of detecting the derailment and the variation in the pressure setting of the auxiliary wheel on the rail.

Figure 5A shows a first configuration of the apparatus of the invention where the transmission means comprise a first pinion (310) and second pinion (920) actuating assembly, intended to transmit movement to the braking system by means of a chain or the like encircling the pinion.

Figure 5B shows a second configuration of the invention where the transmission means comprise a levering actuation (320) and a plurality of levers (910) transmitting movement to the braking system.

**[0017]** Both figures (5A and 5B) are perspective views of the apparatus of the invention with the two mentioned configurations.

Description of a Preferred Embodiment of the Invention

**[0018]** A preferred embodiment of the invention is described below with the aid of the figures.

**[0019]** The invention relates to an apparatus for detecting overspeed of elevator components selected from a car, a counterweight and combinations thereof, having:

A wheel (100), with an auxiliary surface configured to run on a first surface (210) of a travel rail (200) of the elevator component;

Actuating means (300) for actuating a braking mechanism of the elevator component, characterized in that it comprises speed detecting means for generating a synchronized alternating movement with the speed of the elevator component;

**[0020]** The speed detecting means are configured to not generate the synchronized alternating movement when a predetermined speed of the elevator component is exceeded and to thus activate the actuating (300) means;

the speed detecting means comprise a ratchet mechanism comprising:

A polygonal-shaped cam (110) on a side of the wheel (100), integral therewith.

A ratchet wheel (120) on the same side of the wheel (100) and also integral therewith, said ratchet wheel (120) comprising a plurality of projections;
A rocker (130) having a first end and a second end, provided with:

A follower (140) at the first end for following the cam profile (110);
A ratchet (150) at the second end for locking the ratchet wheel (120), thus locking the entire wheel (100).

**[0021]** The apparatus further comprises:

Positioning means, formed by lock washers (400) for pushing the auxiliary surface of the wheel (100) against the first surface (210) of the rail (200) and attempting to prevent the sliding of said auxiliary surface of the wheel on the rail;
Means of detecting the derailment and the variation in a pressure setting of the auxiliary surface of the wheel (100) on the rail (200).

**[0022]** According to a second preferred embodiment of the invention, the apparatus further comprises slip monitoring means formed by an encoder (500) configured to control when the auxiliary wheel (100) slips by comparing a rotation speed of the auxiliary wheel (100) with a travel speed of the elevator component.
**[0023]** According to a third preferred embodiment of the invention, the apparatus further comprises at least one roller (600) configured to roll on a second surface (220) of the rail (200) opposite to the first surface (210) of the rail (200) for:

Offsetting a stress exerted by the auxiliary wheel (100) on the rail (200) for preventing a transmission of a reaction force on the elevator component;
Setting a pressure between the auxiliary wheel (100) and the rail (200).

**[0024]** According to a fourth preferred embodiment of the invention, the apparatus further comprises a remote actuating means or coil (800) for voluntarily engaging the ratchet (150).
**[0025]** Another embodiment of the invention relates to a system for detecting overspeed of an elevator component characterized in that it comprises at least one apparatus such as the one described above and transmission means joined to the actuating means (300) for transmitting an actuating movement to the braking mechanism of the elevator component.
**[0026]** In one configuration of the invention:

The apparatus is arranged in an upper part of the elevator component and the transmission means comprise a plurality of levers (910).

**[0027]** In another configuration of the invention:

The apparatus is arranged in a lower part of the elevator component and the transmission means comprise a first pinion (310) and second pinion (920) actuating assembly, which is intended to transmit movement to the braking system by means of a chain or the like encircling it.

## Claims

**1.** An apparatus for detecting overspeed of elevator components selected from a car, a counterweight and combinations thereof, having:

an auxiliary wheel (100) configured to run on a first surface (210) of a travel rail (200) of the elevator component;
actuating means (300) for actuating a braking mechanism of the elevator component; and
speed detecting means for generating a synchronized alternating movement with the speed of the elevator component;
the speed detecting means are configured to not generate the synchronized alternating movement when a predetermined speed of the elevator component is exceeded and to thus activate the actuating (300) means;
the speed detecting means comprise a ratchet mechanism comprising:

a polygonal-shaped cam (110) on a first side of the auxiliary wheel (100) integral with said auxiliary wheel (100);
a ratchet wheel (120) on the first side of the auxiliary wheel (100) integral with said auxiliary wheel (100), said ratchet wheel (120) comprising a plurality of projections;
a rocker (130) having a first end and a second end, provided with:

a follower (140) at the first end for following the cam profile (110);
a ratchet (150) at the second end for locking the ratchet wheel (120) and thus locking the auxiliary wheel (100);

**characterized in that**:
it comprises:

positioning means, comprising a plurality of lock washers (400) for pushing the auxiliary wheel (100) against the first surface (210) of the rail (200) and preventing sliding of the auxiliary wheel (100) on the rail (200); and
means for detecting derailment and variation in a pressure setting of the auxiliary wheel (100)

on the rail (200).

2. The apparatus of claim 1 **characterized in that** it further comprises slip monitoring means formed by an encoder (500) configured to control when the auxiliary wheel (100) slips by comparing a rotation speed of the auxiliary wheel (100) with a travel speed of the elevator component.

3. The apparatus of any of claims 1-2 **characterized in that** it further comprises at least one roller (600) configured to roll on a second surface (220) of the rail (200) opposite to the first surface (210) of the rail (200) for:

offsetting a stress exerted by the auxiliary wheel (100) on the rail (200) for preventing transmission of a reaction force on the elevator component;
setting a pressure between the auxiliary wheel (100) and the rail (200).

4. The apparatus of any of claims 1-3 **characterized in that** it further comprises remote actuating means or coil (800) for engaging the ratchet (150) voluntarily.

5. A system for detecting overspeed of elevator components selected from a car, a counterweight and combinations thereof, **characterized in that** it comprises at least one apparatus according to any of claims 1-4 and transmission means joined to the actuating means (300) for transmitting an actuating movement to the braking mechanism of the elevator component.

6. The system of claim 5, arranged in an upper part of the elevator component, **characterized in that** the transmission means for transmitting the actuating movement to the braking mechanism comprise a plurality of levers (910).

7. The system of claim 5, arranged in a lower part of the elevator component, **characterized in that** the transmission means for transmitting the actuating movement to the braking mechanism comprise a first pinion (310) and second pinion (920) actuating assembly, where second pinion (920) is configured to transmit movement to the braking system by means of a chain meshing in said second pinion (920).

**Patentansprüche**

1. Vorrichtung zum Detektieren einer überhöhten Geschwindigkeit von Aufzugskomponenten, und zwar einer Aufzugskabine, einem Gegengewicht oder von beidem, wobei die Vorrichtung Folgendes aufweist:

ein Hilfsrad (100), das dafür konfiguriert ist, an einer ersten Fläche (210) einer Laufschiene (200) der Aufzugskomponente entlang zu laufen;
ein Betätigungsmittel (300) zum Betätigen eines Bremsmechanismus' der Aufzugskomponente; und
ein Geschwindigkeitsdetektionsmittel zum Erzeugen einer synchronisierten alternierenden Bewegung mit der Geschwindigkeit der Aufzugskomponente;

wobei das Geschwindigkeitsdetektionsmittel dafür konfiguriert ist, die synchronisierte alternierende Bewegung nicht zu erzeugen, wenn eine zuvor festgelegte Geschwindigkeit der Aufzugskomponente überschritten wird, und somit das Betätigungsmittel (300) zu aktivieren;
wobei das Geschwindigkeitsdetektionsmittel einen Ratschenmechanismus umfasst, der Folgendes umfasst:

einen polygonalen Nocken (110) auf einer ersten Seite des Hilfsrades (100), der integral mit dem Hilfsrad (100) ausgebildet ist;
ein Sperrrad (120) auf der ersten Seite des Hilfsrades (100), das integral mit dem Hilfsrad (100) ausgebildet ist, wobei das Sperrrad (120) mehrere Vorsprünge umfasst;
einen Kipphebel (130), der ein erstes Ende und ein zweites Ende aufweist und mit Folgendem versehen ist:

einem Stößel (140) an dem ersten Ende, der dem Nockenprofil (110) folgt;
einer Ratsche (150) an dem zweiten Ende, um das Sperrrad (120) und **dadurch** das Hilfsrad (100) zu sperren;

**dadurch gekennzeichnet, dass**
sie Folgendes umfasst:

ein Positionierungsmittel, das mehrere Verriegelungsscheiben (400) umfasst, um das Hilfsrad (100) gegen die erste Fläche (210) der Schiene (200) zu drücken und ein Gleiten des Hilfsrades (100) an der Schiene (200) zu verhindern; und
ein Mittel zum Detektieren eines Entgleisens und einer Veränderung einer Druckeinstellung des Hilfsrades (100) an der Schiene (200).

2. Vorrichtung nach Anspruch 1, **dadurch gekennzeichnet, dass** sie des Weiteren ein Schlupfüberwachungsmittel umfasst, das durch einen Codierer (500) gebildet wird, der dafür konfiguriert ist, den Schlupf des Hilfsrades (100) zu steuern, indem er eine Drehzahl des Hilfsrades (100) mit einer Bewe-

gungsgeschwindigkeit der Aufzugskomponente vergleicht.

3. Vorrichtung nach einem der Ansprüche 1-2, **dadurch gekennzeichnet, dass** sie des Weiteren mindestens eine Rolle (600) umfasst, die dafür konfiguriert ist, an einer zweiten Fläche (220) der Schiene (200) gegenüber der ersten Fläche (210) der Schiene (200) zu rollen, um:

    eine Belastung auszugleichen, die durch das Hilfsrad (100) auf die Schiene (200) einwirkt, um das Übertragen einer Reaktionskraft auf die Aufzugskomponente zu verhindern;
    einen Druck zwischen dem Hilfsrad (100) und der Schiene (200) einzustellen.

4. Vorrichtung nach einem der Ansprüche 1-3, **dadurch gekennzeichnet, dass** sie des Weiteren ein Fernbetätigungsmittel oder eine Wicklung (800) umfasst, um die Ratsche (150) freiwillig in Eingriff zu nehmen.

5. System zum Detektieren einer überhöhten Geschwindigkeit von Aufzugskomponenten, und zwar einer Aufzugskabine, einem Gegengewicht oder von beidem, **dadurch gekennzeichnet, dass** das System mindestens eine Vorrichtung nach einem der Ansprüche 1-4 sowie ein Übertragungsmittel umfasst, das mit dem Betätigungsmittel (300) .verbunden ist, um eine Betätigungsbewegung zu dem Bremsmechanismus der Aufzugskomponente zu übertragen.

6. System nach Anspruch 5, das in einem oberen Teil der Aufzugskomponente angeordnet ist, **dadurch gekennzeichnet, dass** das Übertragungsmittel zum Übertragen der Betätigungsbewegung zu dem Bremsmechanismus mehrere Hebel (910) umfasst.

7. System nach Anspruch 5, das in einem unteren Teil der Aufzugskomponente angeordnet ist, **dadurch gekennzeichnet, dass** das Übertragungsmittel zum Übertragen der Betätigungsbewegung zu dem Bremsmechanismus eine aus einem ersten Ritzel (310) und einem zweiten Ritzel (920) bestehende Betätigungsbaugruppe umfasst, wobei das zweite Ritzel (920) dafür konfiguriert ist, eine Bewegung zu dem Bremssystem mittels einer Kette zu übertragen, die das zweite Ritzel (920) in Eingriff nimmt.

**Revendications**

1. Appareil pour détecter une vitesse excessive des composants d'un ascenseur choisis parmi une cabine, un contrepoids et leurs combinaisons, comprenant :

    une roue auxiliaire (100) configurée pour circuler sur une première surface (210) d'un rail de déplacement (200) du composant d'ascenseur ;
    des moyens d'actionnement (300) pour actionner un mécanisme de freinage du composant d'ascenseur ; et
    des moyens de détection de vitesse pour générer un mouvement alternatif synchronisé avec la vitesse du composant d'ascenseur ;
    les moyens de détection de vitesse sont configurés pour ne pas générer le mouvement alternatif synchronisé lorsqu'une vitesse prédéterminée du composant d'ascenseur est dépassée et ainsi pour activer les moyens d'actionnement (300) ;
    les moyens de détection de vitesse comprennent un mécanisme d'encliquetage comprenant :

        une came de forme polygonale (110) sur un premier côté de la roue auxiliaire (100) solidaire de ladite roue auxiliaire (100) ;
        une roue à rochet (120) sur le premier côté de la roue auxiliaire (100) solidaire de ladite roue auxiliaire (100), ladite roue à rochet (120) comprenant une pluralité de saillies ;
        un culbuteur (130) ayant une première extrémité et une seconde extrémité, prévu avec :

            un poussoir de came (140) au niveau de la première extrémité pour suivre le profil de came (110) ;
            un encliquetage (150) au niveau de la seconde extrémité pour bloquer la roue à rochet (120) et bloquant ainsi la roue auxiliaire (100) ;

**caractérisé en ce qu'**il comprend :

    des moyens de positionnement comprenant une pluralité de rondelles de blocage (400) pour pousser la roue auxiliaire (100) contre la première surface (210) du rail (200) et empêchant le coulissement de la roue auxiliaire (100) sur le rail (200) ; et
    des moyens pour détecter le déraillement et la variation d'un réglage de pression de la roue auxiliaire (100) sur le rail (200).

2. Appareil selon la revendication 1, **caractérisé en ce qu'**il comprend en outre des moyens de surveillance de coulissement formés par un encodeur (500) formés pour contrôler, lorsque la roue auxiliaire (100) coulisse, en comparant une vitesse de rotation de la roue auxiliaire (100) avec une vitesse de déplacement du composant d'ascenseur.

**3.** Appareil selon l'une quelconque des revendications 1 à 2, **caractérisé en ce qu'**il comprend en outre au moins un rouleau (600) configuré pour rouler sur une seconde surface (220) du rail (200) opposée à la première surface (210) du rail (200) pour :

décaler une contrainte exercée par la roue auxiliaire (100) sur le rail (200) pour empêcher la transmission d'une force de réaction sur le composant d'ascenseur ;
régler une pression entre la roue auxiliaire (100) et le rail (200).

**4.** Appareil selon l'une quelconque des revendications 1 à 3, **caractérisé en ce qu'**il comprend en outre des moyens d'actionnement à distance ou une bobine (800) pour mettre en prise l'encliquetage (150) volontairement.

**5.** Système pour détecter une vitesse excessive des composants d'un ascenseur choisis parmi une cabine, un contrepoids et leurs combinaisons, **caractérisé en ce qu'**il comprend au moins un appareil selon l'une quelconque des revendications 1 à 4 et des moyens de transmission assemblés aux moyens d'actionnement (300) pour transmettre un mouvement d'actionnement au mécanisme de freinage du composant d'ascenseur.

**6.** Système selon la revendication 5, agencé dans une partie supérieure du composant d'ascenseur, **caractérisé en ce que** les moyens de transmission pour transmettre le mouvement d'actionnement au mécanisme de freinage comprennent une pluralité de leviers (910).

**7.** Système selon la revendication 5, agencé dans une partie inférieure du composant d'ascenseur, **caractérisé en ce que** les moyens de transmission pour transmettre le mouvement d'actionnement au mécanisme de freinage comprennent un ensemble d'actionnement de premier pignon (310) et de second pignon (920), où le second pignon (920) est configuré pour transmettre le mouvement au système de freinage au moyen d'une chaîne s'engrenant dans ledit second pignon (920).

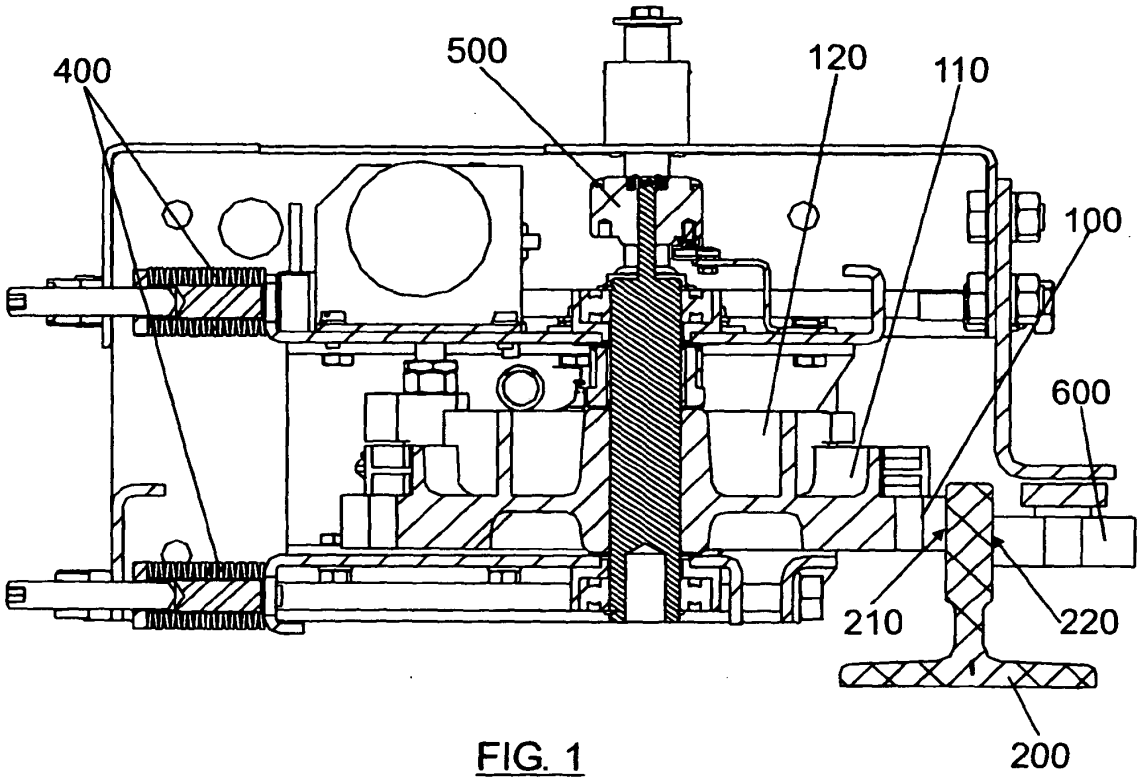



FIG. 1

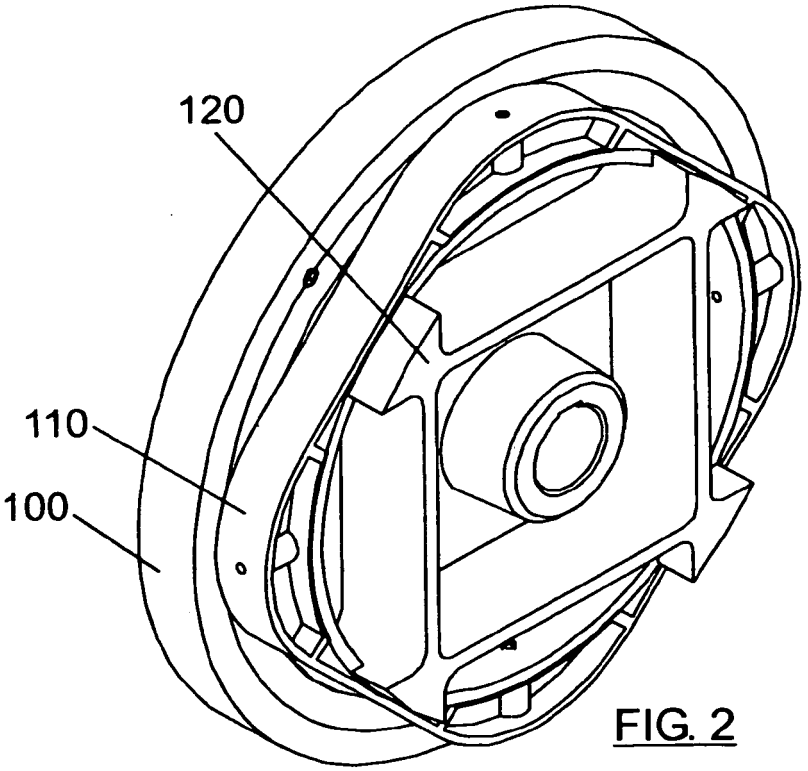



FIG. 2

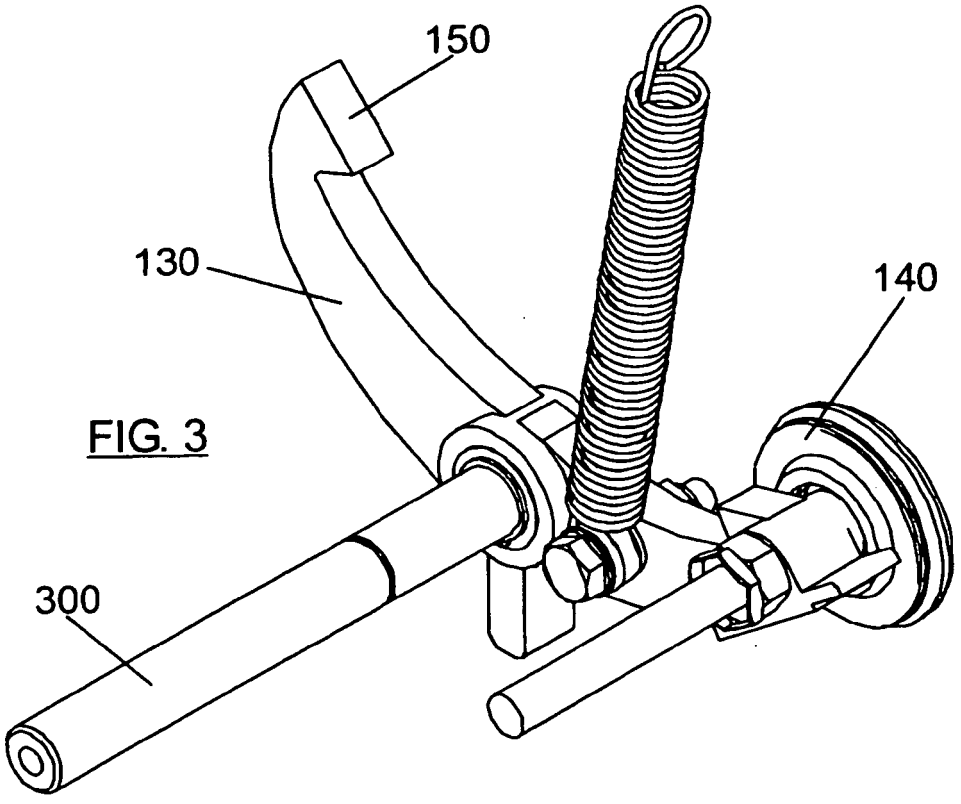



FIG. 3

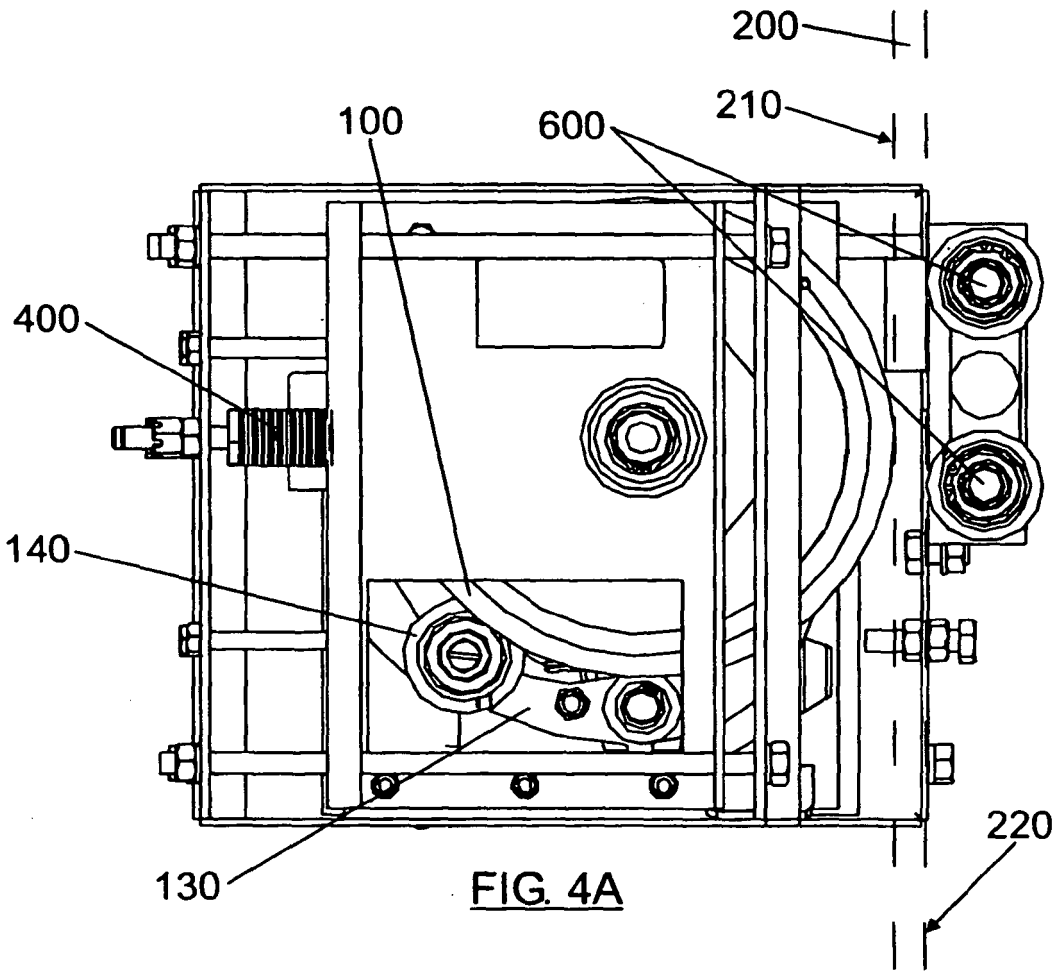
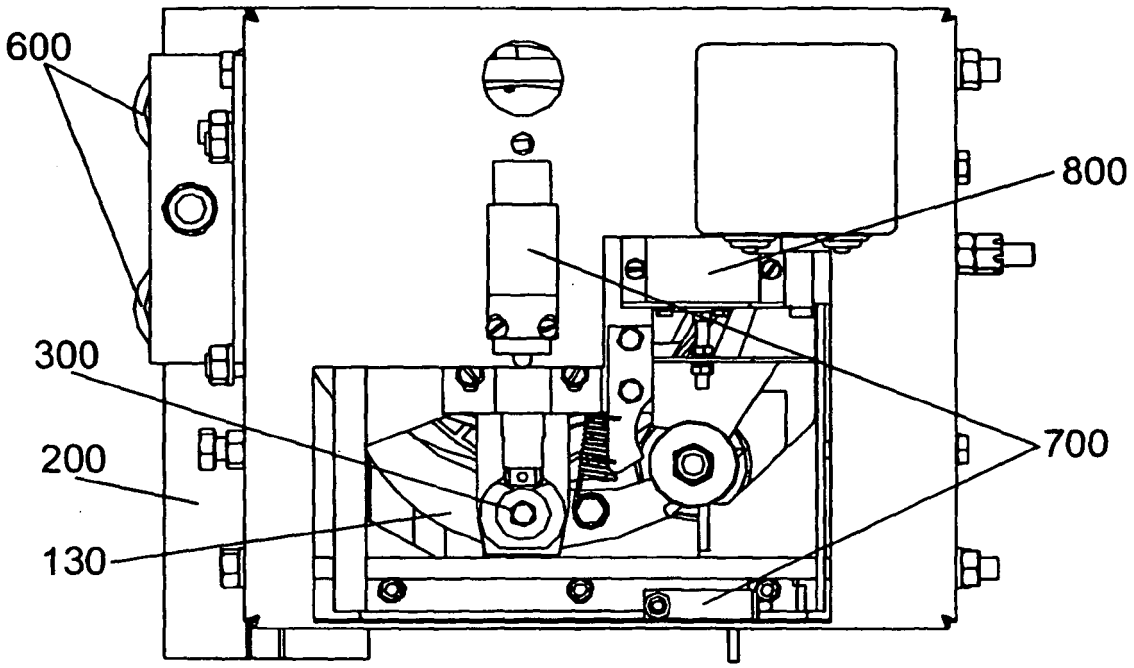



FIG. 4A

FIG. 4B



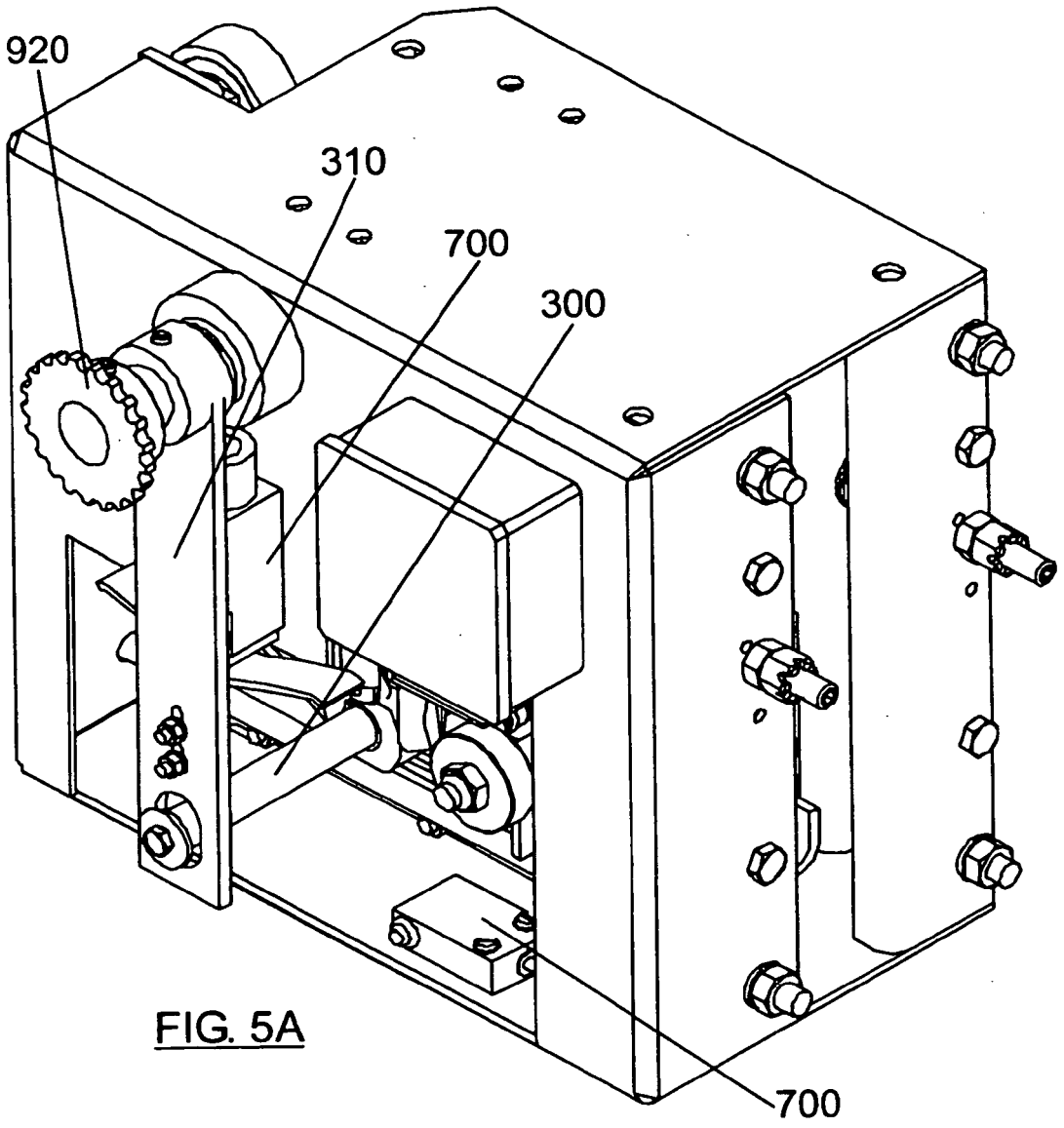



FIG. 5A

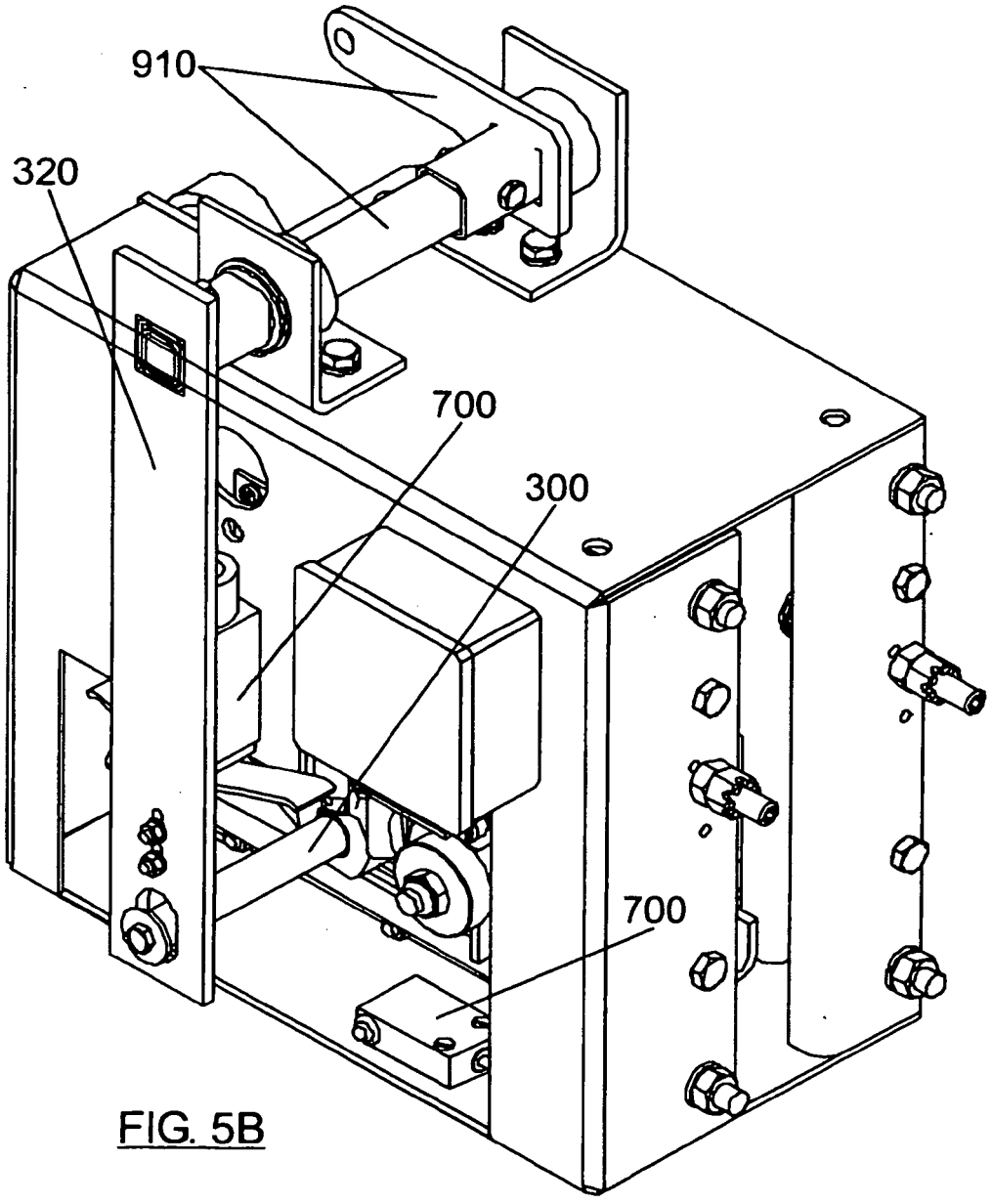



FIG. 5B

## REFERENCES CITED IN THE DESCRIPTION

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